Appl. No. 10/651,681
Amdt. dated October 27, 2006
Reply to Office Action of June 27, 2006

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REMARKS/ARGUMENTS

In the Office Action mailed June 27, 2006, the Examiner withdrew the prior rejection of claims 1-8 and 10 over the combination of Mutalik in view of Fujiwara, but established a new grounds of rejection of claims 1-8 and 10 under 35 U.S.C. § 102(e) as being anticipated by the US2003/0177323 application publication to Popp.

Applicants express thanks to Examiner Dare for the courtesy of a telephone interview on September 27, 2006 during which the Popp reference and pending claims were discussed, though no resolution was reached. In this Amendment, the independent claims have been amended per the language discussed with Examiner Dare, and it is believed the amended claims are in condition for allowance. Further examination of this application is requested.

The Disclosed Invention

The invention relates to storage systems in which data is stored in a data store generally called a main storage volume and also is stored in duplicate in another data store, called a sub-volume. The data is generally mirrored from the main volume to the sub-volume, an operation mode called a pair condition. Data can also be stored such that the pair condition is suspended and data is not mirrored (that is, the data is not duplicated from the main volume to the sub-volume). This latter condition is called a split condition.

If data operations are conducted on the sub-volume in the split condition, then upon a shift from the split condition back to the pair condition, a resynchronization process must be performed in which the data contents of the sub-volume are made consistent with the contents of the main volume. Unfortunately, it is possible for data operations on the sub-volume to be affected or destroyed before they can be duplicated from the sub-volume back to the main volume. More particularly, operations can be carried out that destroy data in the sub-volume before such data can be made consistent with data in the main volume.

The present invention ensures that storage system users will be informed and that data will be successfully duplicated from the sub-volume back to the main volume, through the claimed configuration and processing. That is, the claims as amended recite system and method

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in which the destruction of data stored in the sub-volume because of user error or an incorrect resynchronization operation is avoided.

The Claim Amendments

All of the independent claims have been amended and recite a storage system in which unique features are provided, in particular:

(1) the storage system includes a plurality of information processing units, a managing computer, a storage device with a plurality of logical volumes, and a user interface;

(2) the system operates to include accepting a change of pair condition between said first logical volume and said second logical volume at the managing computer, wherein said accepted change comprises a shift from said second process to said first process initiated through the user interface, wherein said managing computer inquires to an information processing unit accessible to said second logical volume as to whether or not said second logical volume is mounted available to read and write from said information processing unit;

(3) the system operates such that, when as a result of said inquiring by the managing computer, if the managing computer finds that said second logical volume is mounted available to read and write from said information processing unit, then outputting an indication that the second logical volume is mounted through the user interface of the managing computer without instructing the change to said pair condition to said information processing unit.

That is, a change of the pair condition is accepted through the user interface to change the pair condition of a first volume and a second volume, and the managing computer inquires of an information processing unit as to whether the second logical volume is mounted and available to the unit. In addition, if the managing computer fids that the second logical volume is mounted and available, then an indication is provided through the user interface that the second logical unit is mounted, without instructing the information processing unit as to a change in the pair condition.

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In this way, the system keeps a user informed of the availability and avoids operations involving changing a pair condition that might destroy data before it can be duplicated to the main storage volume.

The Popp Reference

The Examiner asserted that the Popp reference anticipated the claims of this application. The claim amendments, however, recite the additional features noted above, which are not provided by Popp. Therefore, Popp does not anticipate the claims as amended.

More particularly, the US2003/0177323 publication reference to Popp describes a system in which paired storage units are operated for autorecovery operations and pair resynchronization. For example, at Paragraph [0039] of Popp, it is noted that "The status of the [storage unit pair] is used to determine the next course of action" and if "the status indicates a pair suspended condition, this can lead to automatic pair resynchronization" and Popp also notes that automatic pair resynchronization can occur "based upon whether or not a flag is set, for example, based upon an autorecover flag being set."

As noted above, resynchronization operations in which data in a sub-volume is made consistent with data in a main volume can sometimes lead to destruction of data. In the claimed invention, the system accepts a change of pair condition between the first logical volume and the second logical volume at the managing computer, wherein the accepted change comprises a shift from a second process to a first process initiated through the user interface, wherein the managing computer inquires to an information processing unit accessible to the second logical volume as to whether or not the second logical volume is mounted available to read and write from the information processing unit, and the system also operates such that, when as a result of the inquiry by the managing computer, if the managing computer finds that the second logical volume is mounted available to read and write from the information processing unit, then the system outputs an indication that the second logical volume is mounted through the user interface of the managing computer without instructing the change to the pair condition to said information processing unit. Thus, the present invention ensures that storage system users will be informed and that data will be successfully duplicated from the sub-volume